

# Interdisciplinary approach to palatally impacted canine

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## ABSTRACT

Interdisciplinary approach for the management of malocclusion provides a holistic approach of patient management. Prudent treatment planning is necessary to achieve the various treatment goals. The article highlights the salient features and various surgical and orthodontic considerations to approach cases with impacted canines. It is exemplified with a case in which a palatally impacted canine and a highly placed canine in the buccal vestibule have been surgically intervened and orthodontically extruded with sequential traction and aligned in the arch.

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## INTRODUCTION

Impaction of tooth is a retardation or halt in the normal process of eruption. A canine is considered as being impacted if it is interrupted after complete root development or if the contralateral tooth is erupted for at least 6 months with complete root formation.<sup>[1]</sup> Maxillary canines are one of the most commonly impacted teeth after the third molars with prevalence in the range of 0.8–2.8%.<sup>[2]</sup> The incidence of mandibular canine impaction is about 20 times lower than maxillary canine impaction. Maxillary canine impactions occur twice as often in females than in males in the ratio 2.3:1.<sup>[2]</sup>

Majority of the canine impactions are palatal (85%).<sup>[3,10]</sup> It is also reported that only 8% of canine impactions are bilateral. Coulter and Richardson<sup>[4]</sup> state that in three planes of space, maxillary canines travel almost 22 mm from their position at the age of 5 years to their position at 15 years.

The positional changes of canine between 8 and 10 years of age need careful observation for detection of potential impaction.<sup>[5,9,10]</sup> In this stage, the canine normally migrates buccally from a position lingual to the root apex of its deciduous precursor; however, some

canines do not make this transition from the palatal to the buccal side and remain palatally impacted.<sup>[6,7]</sup> If a maxillary permanent canine appears to be erupting ectopically or not at all, the extraction of the primary canine is recommended in the 10–13 age groups.<sup>[5]</sup> In a vast majority of cases, extraction of deciduous canine improves the possibilities of eruption or at least changes to a more favorable position, which later improves the prognosis of the permanent canine, if surgical orthodontic guidance is needed.<sup>[7,10]</sup>

Surgically assisted orthodontic guidance is required when a definite diagnosis of impaction has been made, and all possibilities of its natural eruption have been exhausted, it is done at least 6 months after complete root apex formation.<sup>[5]</sup> The flap designs for the surgical exposure of the impacted tooth are done keeping in mind the preservation of the band of attached gingiva which is critical for periodontal health of the treated cases.<sup>[7]</sup> Preferably, the tooth is guided to erupt through its natural point of eruption.<sup>[7]</sup> If a tooth cuts through the oral mucosa, attached gingiva is made available either by apically repositioning the flap, a laterally repositioned pedicle graft or a free gingival graft.<sup>[5]</sup>

## CASE REPORT

A 14-year, 10-month old girl came to the Department of Orthodontics and Dentofacial Orthopedics at Saraswati Dental College, Lucknow, India, with the chief complaint of crooked front teeth. She was physically healthy and had no history of medical or dental trauma. No signs or symptoms of temporomandibular joint dysfunction or trauma were noted at the initial examination.

The extraoral clinical examination showed a straight profile, without any gross asymmetry [Figure 1]. The intraoral examination showed Angle Class II division 1 subdivision left malocclusion, with severe crowding in the upper and lower arch. Left maxillary canine was missing in the maxillary arch. Right canine was in buccoversion, placed highly in the vestibule. Crossbite was seen in relation to 22. Upper midline was shifted to the right by 3 mm and lower midline was also shifted to the right by 5 mm. Overbite was 90% with an exaggerated curve of Spee of 3 mm. Palatal bulge was identified in the maxillary left palatal region suggestive of the position of the impacted canine [Figures 2 and 3].

Cephalometrically, the patient had a Class II skeletal relationship, hyperdivergent mandible ( $FMA = 31^\circ$ ) with a vertical growth pattern ( $Y$  axis =  $65^\circ$ ) and increased lower anterior facial height. The panoramic radiograph [Figure 4] showed all permanent teeth including developing third molar buds and maxillary

left canine. The left canine was mesially inclined toward the midline and was apparently overlapping the mesial aspect of the maxillary central incisor. Periapical radiographs were taken with the Clarks tube shift technique to confirm the palatal position of the left impacted canine. Occlusal X-ray was also done to co-relate with the clinical findings. Growth analysis indicated that the patient was past the peak pubertal growth spurt.

### Treatment objectives

1. The treatment plan was to obtain space for the alignment of the crowded teeth and extrusion of the impacted canine.
2. The midline had to be corrected and the arches leveled by intrusion of the anterior teeth.
3. In addition, it was planned to surgically expose the impacted left canine and bond attachment to it and erupt it carefully into the arch in its normal position and align it.
4. The final objective was to achieve a stable functional occlusion with normal overjet and overbite, Class I canine and molar relationship.
5. A minimum impact on the soft tissue profile had been maintained.

### Treatment alternative

Other possible treatment option was explained to the patient and the parents whereby the impacted canine could be extracted along with first premolars in all the other quadrants. During the finishing stage,



Figure 1: Pre-treatment extraoral photographs



Figure 2: Pre-treatment intraoral photographs

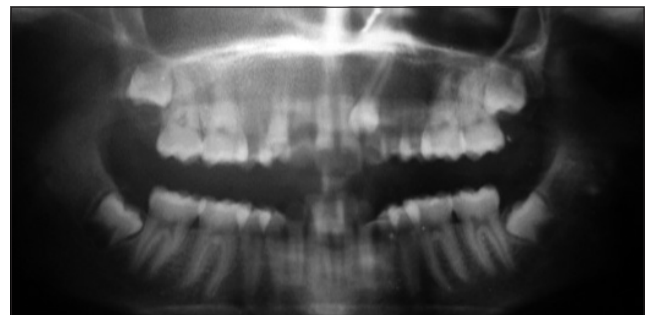


Figure 3: Pre-treatment OPG



the premolar could be reshaped into a canine with a possibility of root canal treatment followed by suitable full crown coverage prosthesis.

Finally, it was decided to attempt the forced eruption and alignment of the impacted canine. Both an oral surgeon and a prosthodontist were consulted to formulate the final treatment plan. In spite of the fact that this treatment was not risk-free compared with the other alternative, the parents wanted to try to avoid root canal treatment and prosthesis; they wanted to try to save the canine and bring it into the occlusion. A consent form had been signed by them.

### Treatment progress

Initially, 14, 34 and 44 were extracted and the molars were banded and all the other remaining teeth were bonded with  $0.022 \times 0.028$  inch pre-adjusted edgewise appliance [Figure 4]. The maxillary left premolar had been extracted which till now had also served as a space maintainer for the impacted canine and prevent any space loss. After initial leveling and aligning, a  $0.019 \times 0.025$  inch stainless steel arch wire was placed in the maxillary arch.

The surgical exposure by creating a window had been carried out by the oral surgeon in this stage and the attachment was bonded [Figure 5]. Attached gingival attachment was maintained on the impacted tooth for good periodontal prognosis. The attachment was ligated to the overlay  $0.016$  inch NiTi wire and progressively activated to maintain a force of  $60\text{--}90$  g. At this stage, maxillary left first premolar had also been extracted within 1 month when canine was found to start erupting [Figure 6].

The pull on the canine was directed distally toward the extraction space which not only caused the eruption of the canine but also corrected its mesio-distal inclination. This also pulled the canine away from the root of the central incisor.

The bracket on the labial aspect of the canine was inverted to correct the torque and ligated to the auxiliary  $0.016$  inch NiTi wire and progressively increased to  $0.019 \times 0.025$  inch stainless steel wire. Subsequently, finishing was done with  $0.014$  inch NiTi wire for both the upper and lower arches [Figure 7].

### Treatment results

Overall, active treatment lasted for 20 months. There was a dramatic improvement in patient's smile. Class I canine and molar relationships had been achieved with ideal overjet and overbite. Canine guidance had been established bilaterally during lateral excursive movements. Midlines were coincident and in line with



Figure 4: Leveling and aligning

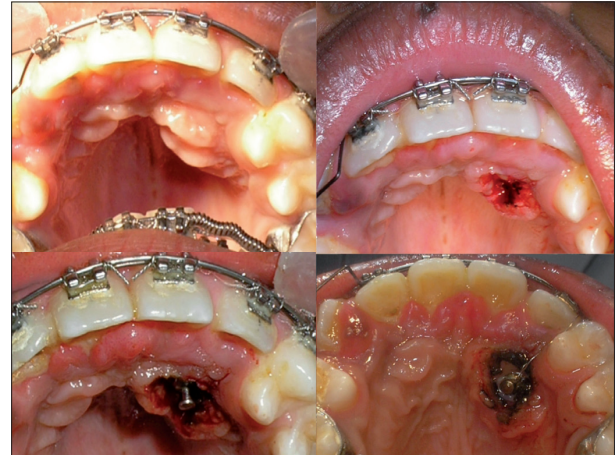


Figure 5: Surgical exposure of canine



Figure 6: Extrusion of impacted canine

the face [Figures 8 and 9]. Post-treatment panoramic tracing on comparison with the pre-treatment showed that the roots were well angulated and aligned parallel [Figure 10].

## DISCUSSION

According to the criteria put forth by Lindauer,<sup>[1]</sup> the present case was diagnosed with a palatally impacted left canine. It consisted of the fact that root formation had been completed for both right and left canines. It is also noted that right canine has erupted for more than 6 months in the oral cavity without any signs of eruption of the left canine.

Power and Short<sup>[6]</sup> predicted the chances of canine



Figure 7: Finishing and detailing



Figure 8: Post-treatment extraoral photographs



Figure 9: Post-treatment intraoral photographs

impaction based on calculating the angulation of the canine on an orthopantomograph; the angulation of the long axis of the canine to the midline may be monitored from the time root formation is one-third complete to 6 months after root completion, 10–13 years of age. If the tooth is angled more than  $31^\circ$  to the midline, its chances of eruption even after deciduous extraction are decreased. Exactly 91% of the ectopically erupting canines come into proper occlusion if the canine crown was distal to the midline of the lateral incisor at the time of removal of the deciduous canine.<sup>[8]</sup> If the crown was mesial to the midline of the lateral incisor root, spontaneous incisor eruption occurred in only 64% cases.<sup>[8]</sup> In the present case, the impacted maxillary canine was  $21^\circ$  to the midline in the pre-treatment stage which is in agreement with the criteria put forth by Power and Short<sup>[6]</sup> for successful canine disimpaction; also, the canine crown was distal to the midline of the lateral incisor in agreement with the criteria of Warford *et al.*<sup>[8]</sup>

Vanarsdall<sup>[11]</sup> states that as the palate is all masticatory mucosa; therefore, graft is not placed on the tooth. To uncover a palatally impacted tooth, the palatal tissue is

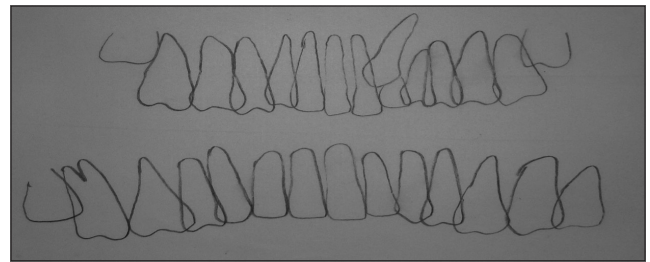


Figure 10: Comparison of pre-treatment and post-treatment OPG views

reflected, a window is placed, and the tissue is replaced over the palate. A periodontal dressing is kept in place for 7–10 days, and then a bonded attachment is placed and tooth movement is begun. This approach has been successfully used in the current case in terms of adequate attached gingival tissue preservation around the disimpacted canine.

Goodsell<sup>[12]</sup> advocates that any tooth that has been surgically uncovered and is under orthodontic traction forces should be periodically checked for excessive mobility or bleeding from gingiva around the tooth. Care must be taken to ensure that periodontal attachment is following the tooth as it is guided into the arch. In the present case, the periodontal health of the disimpacted tooth has been periodically evaluated and a margin of attached gingiva has been preserved around the gingival margin.

Light force mechanics advocated by Becker<sup>[7]</sup> and Kokich *et al.*,<sup>[13]</sup> have been successfully used in the present case to bring the palatally impacted canine into the arch, while preventing any adverse effects and non-vitality of the adjacent teeth.



Correction of torque, labio-palatal root angulation in basal bone, in the impacted canine tooth is important to achieve proper functional occlusion. This has been achieved successfully by the method advocated by McLaughlin *et al.*<sup>[14]</sup>

## CONCLUSION

Treatment of impacted tooth is almost always a clinical challenge. Holistic treatment planning, prudent flap design, coupled with forced eruption using light extrusive forces, periodontal health and functional occlusion are central to achieving the desired long-term results.

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